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Pereskia pereskia, a leafy cactus which is perhaps the oldest form found in this family

CACTUS AND SUCCULENT JOURNAL

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The Longevity of Cacti

By DR. FORREST SHREVE

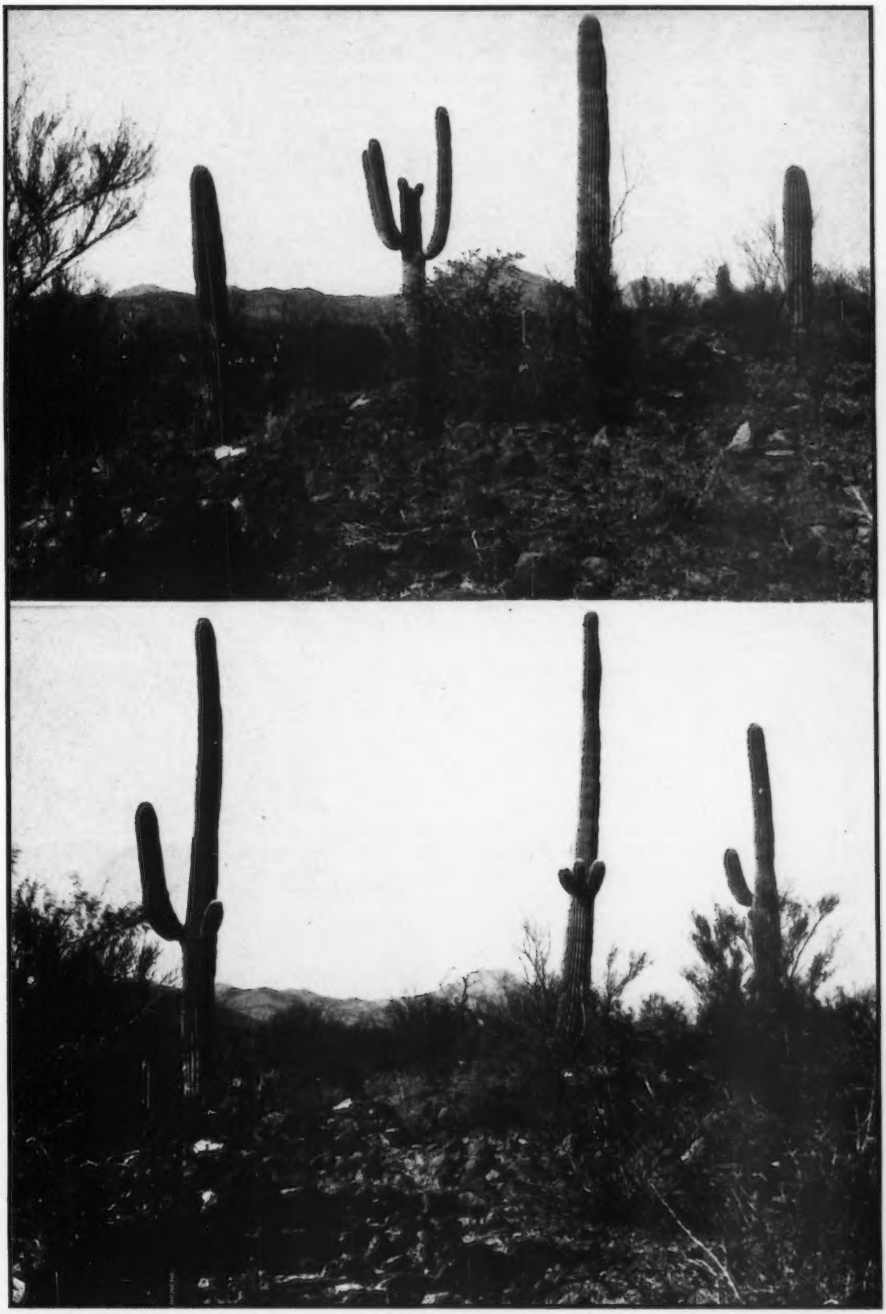
Desert Laboratory of the
Carnegie Institution of Washington
Tucson, Arizona

Our knowledge of the span of life in perennial plants is very incomplete. For trees it is easy to secure reliable figures from the annual rings of growth. For the other types of perennials there are very few cases in which even a rough estimate of the age of a full grown individual can be made. This is true of cacti and all other succulent and semi-succulent plants, as well as nearly all shrubs, vines and root perennials.

In the woody tissue of most of the large cacti there is a constant increase in thickness throughout the life of the plant, but it is seasonal rather than annual and is not punctuated by definite zones of rest as in the trees. In the poorly branched columnar cacti it is possible to estimate age if the rate of growth is known, but there are a number of serious sources of error in this method. The only way to secure exact data on the span of life in cacti, agaves, yuccas, aloes and dudleyas, when living in their natural surroundings, is by making careful measurements and records over a long period of years. It is litttle wonder, then, that we know so little about the subject.

At the Desert Laboratory we have been interested for many years in the life histories and vital statistics of some of the characteristic succulent and non-succulent plants of the region. The means of seed dispersal, germination, character of the seedling, rate of growth, degree of adjustment to the environment, relations with associated plants, and the enemies and diseases of a plant are all important items in its career and length of life. For desert plants in particular the vicissitudes are such that it is necessary to secure data on a considerable number of individuals in order to learn the normal rate of growth or length of life. We are still in the position of feeling that 32 years has been entirely too short a time to enable us to make more than very general statements about the relative longevity of the different types of cacti.

The rate of growth of *Carnegiea gigantea* has been measured in several localities on individuals ranging from 4 in. to 20 ft. in height. This has made it possible to estimate the length of time required for a plant to make a stated amount of growth. It is very difficult, however, to determine the age of plants which are 4 in. high. Under natural conditions the early development of *Carnegiea* is very slow. A 4 inch plant may be anywhere from 8 to 25 years old. Likewise a tree 15 ft. high may be only 60 years old or may



Views taken at the same spot on the grounds of the Desert Laboratory, at Tucson, Arizona, 22 years apart. The older view shows four plants of *Carnegiea* and a large *Opuntia versicolor*. The later views show the oldest *Carnegiea* gone and the others in the branching stage. The dead skeleton of the *Opuntia* is still standing in the center of the later picture.

be nearly 100. The rate of growth of the main trunk in middle-aged individuals is about 4 in. per year. The age of the tallest trees is probably between 150 and 200 years, depending on the rate of their start and the sort of situation in which they grew. It is surely the most long-lived cactus native to the United States.

In the organ-pipe cactus (*Lemaireocereus thurberi*) the early rate of growth is more rapid than in *Carnegiea,* but the rate under natural conditions between 3 ft. and 6 ft. in height is about 3 in. per year, or distinctly slower than in *Carnegiea.* This may be due in part to the existence of several branches, for it is known that the appearance of branches on *Carnegiea* slows down the rate of growth of the main trunk. It seems probable that the organ pipe cacti from 10 to 15 ft. in height are from 50 to 75 years old. From a rather limited series of data on the sinita (*Lophocereus schottii*) it appears that the rate of growth is more rapid than in *Lemaireocereus* and that branches are formed much more abundantly. Throughout the life of an individual old branches are decaying and new ones forming, so that it becomes very difficult to make any estimate of the age of large composite individuals. The relatively rapid growth indicates that there are probably few large plants over 75 years old.

The early growth of the barrel cactus is much more rapid than that of the columnar types, with respect to the size of the plant. In *Ferocactus wislizeni* the first 10 years serve to give the plant a good start and it then maintains a growth in height of about two-fifths of an inch per year for the next 10 or 15 years, during which time the growth in diameter is nearly equal to that in height. After the 25th year there is a slight acceleration in the growth in height and a slowing down of the growth in diameter. The common height of fully matured plants is about 4 ft., although exceptional ones are found of twice that height. From measurements made at the Desert Laboratory over a period of 25 years it appears that *Ferocactus* requires about 85 years to reach a height of 4 ft. If it then happens to have a good footing and to still have a fairly erect position a period of 35 to 45 years more would enable it to reach a height of 6 ft.

The character of growth and branching in the cylindropuntias does not lend itself to satisfactory measurement, and their progress is subject to many backsets through the shedding of joints or death of branches in very dry periods. Our only data on their duration of life are derived from the periodic census of plants taken on certain charted areas on the grounds of the Laboratory. As these observations have only been made over a period of 29 years it is not yet possible to make even approximations of the age to which these plants may attain. There has been high mortality among the large plants of *Opuntia fulgida* that were charted in 1906. There are a number of plants still standing, but unfortunately there is no record of their height in 1906. New plants that have appeared since 1906 have not yet attained the heavy trunk and height of 6 to 8 ft. which characterises the largest individuals in the vicinity. It may be allowable to hazard a guess that the usual span of life in the cholla is about 60 to 80 years. There is some evidence that *Opuntia versicolor* is slightly longer lived than this.

The platyopuntias are decidedly the most rapid growing type among the native cacti of southern Arizona. Three or four years from seed will put the young plant in a position to advance rapidly. In a young vigorous plant it is possible to determine the minimum probable age by counting the number of joints from the tip of an arm back to the base of the plant. Allowance of three to five years must be made for the early stages of growth and an uncertain allowance for the fact that there may have been years in which new joints were not formed on the particular arm that was observed. After 10 to 15 years the platyopuntia is in its prime. Continued growth results in crowding of the joints and shading of the base of the plant. Under the most favorable conditions an age of 30 years or more may be attained, and in the stout erect forms like *Opuntia discata* an even greater age may be reached. In the majority of plants, however, the oldest part is destroyed by fungi, leaving the rooted arms to carry on the growth. The fresh start that is secured by each of the separated parts of a large plant with a decayed center will greatly lengthen the life of the individual, if it can still be called one.

A great deal of valuable corroborative evidence on growth and length of life has been secured by comparing old photographs with recent ones of the same plant or the same spot. It is possible that some of the members of the Cactus and Succulent Society may have pictures taken several years ago which can be re-taken in the same spot and the same position. All the evidence of this kind that can be secured is valuable and should be published or placed on record. So little is known and so much time will be required to build up an adequate fund of information that every piece of definite evidence will be very helpful. In cultivation the growth of cactus plants is so much faster than it is in the wild, that the many easily made observations on our own garden or greenhouse plants are not fitted to throw much light on their behavior when they are subjected to the vicissitudes of desert life.

Notes on the Genus Echeveria

By ERIC WALTHER

III. SOME NEW SECTIONS, SERIES, SPECIES, VARIETIES AND COMBINATIONS

(All photos by author)

ECHEVERIA DC., Section **Secundiflora** EW., Series **Angulatae** EW., new series.

Stem short or none, offsets few; leaves crowded, thick; inflorescence secund, simple or 2 to 3-fid; peduncle mostly stout, erect; bracts frequently many, mostly appressed; pedicels long, short or none; sepals large, appressed to spreading; corolla strongly pentagonal, its segments thick, sharply keeled, deeply hollowed within; nectaries large, thick.

Type species: *Echeveria teretifolia* DC.

12. Echeveria runyonii Rose, new species.

Caudex nonullis vel brevis, foliis rosulatis, albescente-pruinosis, late-spatulatis, 6 - 8 cm. longis, 3 - 4 cm. latis, acutis vel retusis; scapus 15 - 20 cm. altus, bifidus; racemae nutantes; bracteae plures, lineari-oblongae, 2 - 4 cm. longae; pedicella usque ad 4 mm. longa; sepala inequalia, patentissima, usque ad 15 mm. longa; corolla valde pentagona, rosea vel rubra, usque ad 20 mm. longa, 10 mm. diametro, segmentis erectis, strictis.

Stem short or none; leaves rosulate, upcurved at the base, spatulate-cuneate, truncate or retuse, very glaucous, 6 to 8 cm. long, 3 to 4 cm. broad, flattish; inflorescences two or more, 15 to 20 cm. tall; bracts numerous, appressed, flat, linear-oblong, 2 to 4 cm. long; racemes bifid, strongly nodding before anthesis; pedicels to 4 mm. long; sepals widely spreading, very unequal, longest to 15 mm. long; corolla sharply pentagonal, pink to scarlet, glaucous in bud, to 20 mm. long and 10 mm. in diameter; segments erect or slightly spreading.—(Near *E. subsessilis* Rose, on account of its short pedicels; Rose in Mss.)

Type specimens U. S. National Herbarium No. 1319920 (Runyon 22/R:339).

Locality: Known only from cultivated plants found in Mexican garden at Matamoras.

Remarks: As stated by Dr. Rose, this is related to *Echeveria subsessilis*, a close ally of *E. peacockii*, but actually the new species is more nearly akin to *E. derenbergii* Purpus, also with distinctly elongated pedicels. What the normal range of this is remains yet to be discovered; here in California it is usually represented by a distinct variety, deserving of recognition, as follows:

12a. Echeveria runyonii var. **macabeana** EW., new variety.

A typo foliis acutis, non retusis abludens.

Similar to the type, but leaves acute, color deep grape-green, but very glaucous and so appearing pale medici-blue; peduncle upcurved at base, erect above; bracts many, somewhat spreading, obovate-oblong, acute, to 4 cm. long; racemes two, strongly nodding before anthesis, each with 10 or more flowers; pedicels stout, to 6 mm. long; sepals ascending-spreading, longest to 11 mm. long, linear to ovate-lanceolate, free nearly to base, color pale violet-plumbaceous; corolla 19 to 20 mm. long, 10 mm. in basal diameter, color alizarine-pink in bud, later without bloom, scarlet; segments thick; with subulate apiculus and deep basal hollow, inside given a coral-red color by many crowded, fine red lines; carpels sea-shell pink; styles slender; nectaries thick, truncate, coral-pink due to presence of many small, red dots.

Type specimen: Cal. Academy of Sciences No. 223894 (E. Walther 35/51).

Remarks: Named in honor of its original local disseminators; this is certainly not a hybrid, as stated, since it is most unlikely that two so very similar plants could originate at the same time in such widely separated localities.

13. Echeveria heterosepala Rose.

Remarks: Living plants of what must be this species identical with the type, (Pringle 95/7499) from Tehuacan, collected by the writer in the same part of Mexico, have now flowered. They clearly prove, first, that this species belongs into *Pachyphytum*, and secondly, that it is identical with *Pachyphytum chloranthum* EW., which last name must now be reduced to a synonym. The following new combination is therefore in order:

Pachyphytum heterosepalum (Rose) E. Walther, new combination.

Echeveria heterosepala Rose, Bull. N. Y. Bot. Gard., 3:8. 1903.
Echeveria heterosepala Rose, North Am. Flora, *22*:1:20. 1905.
Echeveria viridiflora Rose, Mss., ined.
Pachyphytum chloranthum EW., Am. Cactus Journal, *3*:1:12. 1931.

14. Echeveria teretifolia DC., in Prodromus, 3:401. 1828.

Sedum teretifolium Mocino & Sesse, in Flora Mexicana, ined.
Cotyledon subulifolium Baker, Saund. Ref. Bot., 1869, No. 32.
Echeveria subulifolia Ed. Morren, La Belge Hort., *24*:168. 1874.
Cotyledon schaffneri S. Watson, Proc. Am. Acad., *17*:354. 1882. (*Not E. schaffneri* of Rose, which is *E. paniculata* A. Gray).
Echeveria bifurcata Rose, Cont. U. S. Nat. Herb., *12*:10:439. 1909.

Remarks: Founded by DeCandolle on a rather fragmentary drawing, this species has long remained among the imperfectly known items. However, DeCandolle's "Memoires Crassulaceae," plate 17A., shows a flowering shoot only, but this is secund, bifid, and has sessile flowers, subterete bracts, widely spreading sepals, and a strongly angled corolla, all characters confined to *E. schaffneri* and *E. bifurcata*. Search for valid characters by which to separate these two species revals none worth while, especially since we know *E. bifurcata* to be fairly plastic in response to a changed environment. The circumstances are perhaps done justice by reducing these species to varieties, as follows:

14a. Echeveria teretifolia var. **schaffneri** (S. Watson) EW., new combination.

Leaves somewhat purplish; bracts slightly flattened; corolla 12 to 16 mm. long, yellow to pink.

14b. Echeveria teretifolia var. **bifurcata** (Rose) EW., new combination.

Leaves bright green; bracts subterete; corolla usually 10 to 12 mm. long, bright red above, paler below.

15. Echeveria humilis Rose, Bull. N. Y. Bot. Gard., 3:9:8. 1903; North Am. Flora, 22:1:20. 1905.

Remarks: The type-material of this consists of two different collections. The first mentioned by Rose, (Parry & Palmer 1878/233) consists of mixed material, part of this being *Echeveria agavoides*. Identity of the remainder is doubtful, so that it would be well to consider as the type only the second collection mentioned by Rose, i.e. Schaffner 1878/769.

Series **Secundae** EW., new definition.

Plants small, stemless, mostly cespitose; inflorescence usually simple, rarely bifid; bracts few, small; pedicels slender; corolla small, little angled; styles greenish; nectaries depressed-truncate.

Type species: Echeveria secunda Booth.

16. Echeveria alpina EW., new species.

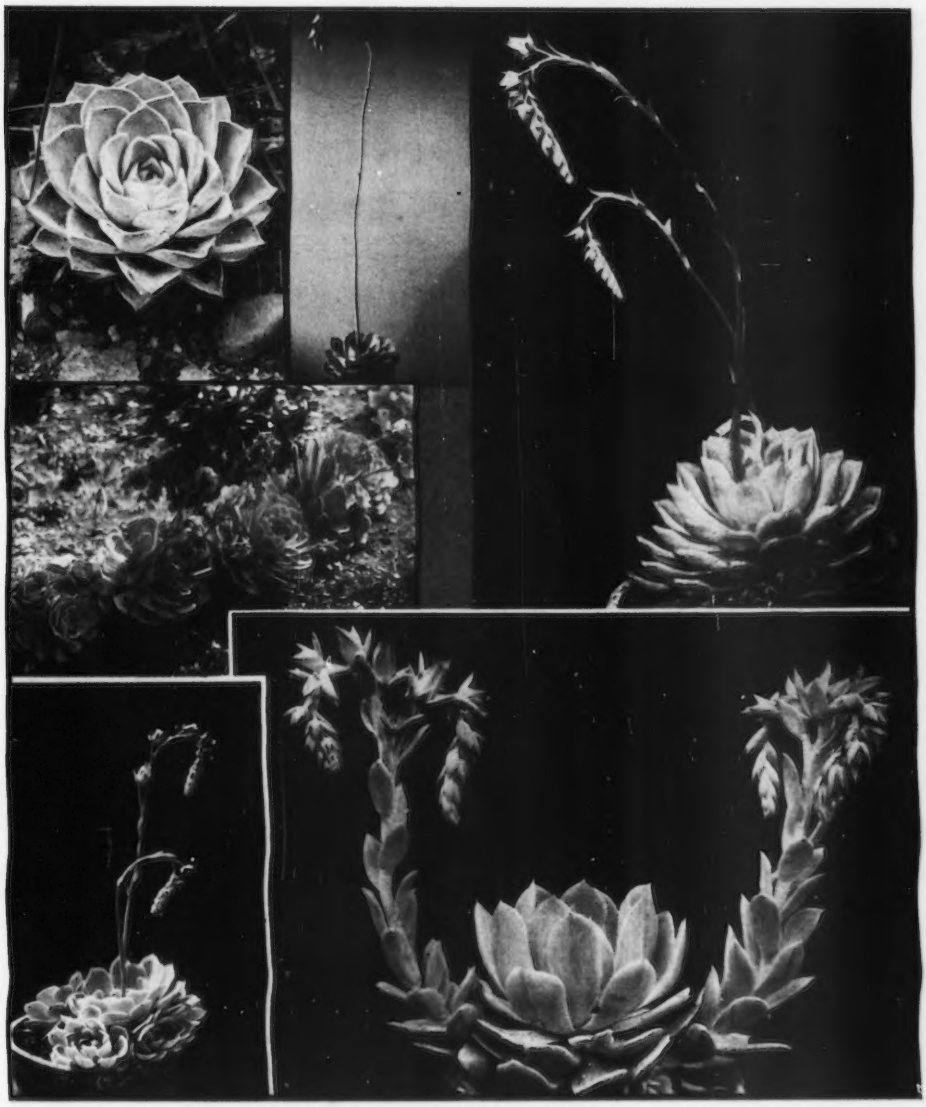
Acaulescens, cespitosa, foliis oblongo-spatulatis, 7 cm. longis, 3 cm. latis, truncatis, mucronatis, perglaucis (non rubrimarginatis); scapus ad 12 cm. altus; bracteae latae, obovato-cuneatae; pedicella 3-5 mm. longa; sepala subequalia, patentia, 7-9 mm. longa; corolla 15 mm. longa, rubro-aurantiaca, glauca, segmentis erectis.

Leaves many, thinnish, glaucous, to 73 mm. long, 30 mm. broad, oblong-spatulate, at apex truncate and mucronate; scape to 12 cm. tall, erect; bracts few, broad, obovate-cuneate, to 15 mm. long; raceme simple, with 10 or more flowers; pedicels 3 to 9 mm. long; sepals somewhat unequal, longest to 10 mm. long, widely spreading at anthesis; corolla to 15 mm. long by 9 mm. in diameter near base, reddish-orange, its segments nearly straight, erect.

Type specimen: Philadelphia Acad. of Sciences, Heilprin & Baker's collection from 14,200 ft. on Mt. Ixtaccihuatl, Mexico.

Material seen: Type, Purpus 03/R:604, Purpus R:05/857; Ixtaccihuatl near timberline. Living plants from Penas de Tomaxco, 3500 m., near Rio Frio, Puebla, Mexico. (EW. 1934/14).

Remarks: The thinnish, glaucous leaves with their truncate apex quite devoid of any reddish tinge, the spreading sepals and large corolla seem distinctive. Related species are *E. tolucensis* Rose, with its leaves acute; *E. glauca* (Baker) with smaller flowers; and *E. secunda* Booth, with leaves more turgid and strongly tinged with red at edges and mucro.



TOP LEFT: *Echeveria potosina* EW., sp. nov., rosette. app. x0.4.

CENTER: *E. potosina* EW., sp. nov., flowering plant. app. x0.2.

RIGHT: E. *gilva* EW., sp. nov., flowering plant. app. x0.4.

LEFT CENTER: *E. alpina* EW., sp. nov., plants grown in Chapultepec Park, Mexico City. app. x0.2.

BOTTOM LEFT: *E. elatior* EW., sp. nov., flowering plant. app. x0.2.

BOTTOM RIGHT: *E. runyonii* var. *macabeana* EW. var. nov. app. x0.3. Flowering plant in collection of V. Reiter, Jr.

17. Echeveria elatior EW., new species.

Acaulescens, conferto-cespitosa, pluri-sobolifera, foliis conferto-rosulatis, turgidis, obovato-cuneatis, 4 cm. longis, 25 mm. latis, viridi-glaucescentibus, rubescenti-mucronatis; scapus elatior, 25 - 30 cm. altus, erectus; bracteae 15 mm. longae, acutae; pedicella 4 - 5 mm. vel usque ad 15 mm. longa; sepala 6 mm. longa; corolla 12 mm. longa, rubella; segmentis erectis; squamae obliquae.

Rosettes dense, with very numerous offsets; leaves turgid, obovate-cuneate, concave above, at apex strongly mucronate, in greenhouse-grown plants 4 to 5 cm. long by 25 mm. broad, color dark greenish-glaucous; scape stout, erect, to 30 cm. tall; bracts few, appressed, 15 mm. long, acute; raceme simple; pedicels 4 to 15 mm. long, erect; sepals to 6 mm. long, ovate-deltoid, mytho-green, spreading or slightly ascending; corolla scarcely urceolate, 11 mm. long, 7 mm. in diameter at base, 5 mm. at mouth; segments erect, straight, outside scarlet to rose-doree with yellow tips; styles elongated, lettuce-green; nectaries oblique, pale greenish-yellow.

Type specimen: Calif. Academy of Sciences No. 223899. (EW. 1934/10).

Locality: El Chico near Pachuca, Hidalgo, Mexico.

Remarks: The type of *E. secunda* Booth came from Real del Monte near Pachuca, to which species this new one is no doubt related. It seems sufficiently distinct by reason of its stouter, more erect peduncle, the less urceolate corolla, the oblique nectaries, etc. Until the entire *Series* can undergo further revision, comment on its position will be inadvisable.

BOOK REVIEW

The "Book of Cacti for the Amateur Collector" by H. C. Lawson is a new style and of value for the cactus gardener. In the beginning of the book are several pages of notes regarding cacti and their culture. In the body of the book are pages illustrating nearly two hundred and fifty species of cacti. Following are notes briefly describing the species illustrated and numerous others. The book deals chiefly with the native species of the United States and Mexico. This book should familiarize our amateurs with the different types of cacti.

The book is the result of six years of field work and cultivating cacti in Texas. Consequently the author is exceedingly well versed in his subject.

The mistakes are chiefly typographical and when the reader realizes that in addition to the exhausting labors of a Cactititian, the author was compelled to completely rebuild his establishment as a result of a terrific hail storm occuring last spring, these errors will be pardoned.

If this effort meets the reception it should, the author plans to issue subsequent volumes covering other sections of the field. LAWSON CACTUS GARDENS, 1223 S. Alamo St., San Antonio, Texas. 36 pgs. 8x11 $1.

HOWARD E. GATES.

Society member, Dr. Shreve, spent most of last year in the field and one of his valued reports is contained in Carnegie Institute's News Service Bulletin dated Sept. 29, 1935. This report describes the Lower California, Mexico, expedition taken by Dr. Shreve, Dr. T. D. Mallery, Dr. T. W. Wiggins and Mr. Jack Whitehead. The purpose of the 2000 mile trip to the tip of the peninsula at Cabo San Lucas was to supplement the Desert Laboratory's investigations regarding vegetation, rainfall, migratory movements of plants and the influence of the sea which borders on the Sonoran Desert.

In addition to the adventures on this difficult mission the following subjects are discussed: Difficulties of travel, the peninsula of Baja California, plant and animal life, uncommon plant types, adaptations to desert conditions, fat-stemmed trees, the transition region, effects of great climatic fluctuations and the return trip.

MEMBER J. W. MANSON OF NOGALES, ARIZONA SENDS THE FOLLOWING NOTE OF INTEREST:

PUBLISHED IN THE OFFICIAL BULLETIN "DIARIO OFICIAL" OF OCTOBER 9th, 1935:

Circular No. 31-1-62940, ratifying the prohibition to export cacti.

"Collector of Customs of—

The Forest, Fishing and Hunting Department on the 2nd of last month issued circular No. 5-5-25285 addressed to all its offices in the country, reading as follows:

'Confirming relative circulars and official letters issued previously by this Department during the present year, I hereby confirm the disposition prohibiting the exploitation and exportation of all kinds of cacti and their seeds in the country, while the corresponding reglamentation is worked out.

Meanwhile and in accordance with express opinion of the Chief of the Department, you will please inform with the least possible delay sending the corresponding data, pictures, drawings, blue-prints, etc. with reference to the existence of cacti and nurseries in your jurisdiction, sending a report of the present existence of these plants together with latest catalogs and prices, stating the names of the persons or firms who exploit said products, the foreign and mexican companies where the shipments are made, and the ports through which the corresponding exportations are performed.

I recommend that you finish your information with the suggestions that you may deem advisable, with the purpose of making the regulations or by-laws on the use of the cacti, as complete as possible, taking into consideration that we are aiming at the conservation, propagation and exploitation of one of our most valued forestal products, which intense, lucrative and badly exploited by foreigners was on the verge of disappearing for lack of proper dispositions to insure their indefinite existence."

I communicate to you the above for your information, so that you may prevent the exportation of the plants in question, thereby seconding the disposition of the Forest, Hunting & Fishing Department.

The following 8 pages are the 11th installment of the reprint of Britton and Rose Vol. II.

The Study of Succulents

An Educational Series

II. EVOLUTION

In the October Journal, some mention was made of the kind of interest to be found in the collecting of cacti and succulents. There are one or two points which should be emphasized. One of them is the difference between a static and a living hobby. Philately, the collection and study of postage stamps, is an inspired and usual divertisement for the shut-in and the arm chair person, but aside from the collecting of new issues, once a stamp is collected it is at rest in a collection. It has no seasonal changes or times of new growth or dormancy. Collections of china, canes, coach-whips, neckties or match boxes produce no marvelous flowers nor do they reproduce themselves by seed. They give no insight to the process of leafing. The joy of watching a tiny sedling planted is denied the stamp collector or other static collectors. Of less importance to the dallier with the sciences is the fact that since the Cactus & Succulent Society of America reawakened world interest in the collection of arid and semi-arid plants, literally thousands of persons were able to add to their depression-decreased incomes by the sale of their propagations and in many instances actually kept the table going.

Now, in order that a general view may be had of how such plants came into existence, let us use our imaginations and look at this dark star we call the earth. Imagine ourselves out in space so that the earth was reduced in appearance to a globe about half a yard in diameter and lighted by the sun. Have you ever thought what it would look like? It would be a shining globe; its surface smoother than the average egg with a slight stain upon its surface indicating the presence of oceans and a still fainter stain representing dense masses of forests and vegetation. The heights of the highest mountains and the depths of the deepest valleys would be so slight in comparison to the diameter of the earth as to scarcely give sign of their presence. The 8,000 mile thickness of this globe is, so far as we know, devoid of life except for this thin surface film in which we live and breathe and have our being. In this insignificant film occurs all our experiences; our loves and hates; our passing empires; our archeology and history; our wars, conquerors and poets; all apparently insignificant except to ourselves. Limited in another way by the effervescence of living, are our own leaf forms such as the big trees of Australia, California and the Canary Islands existing at most for not more than a few thousand years and our ephemeral plants springing up after rain, flowering and dying within six weeks. Our Hitlers and Mussolinis prance the stage of life for a few brief moments in the eternal span of time. How insignificant both spatially and temporal they all are.

Until the time of Charles Darwin (1846) it was universally believed that all the plants and animals in the world were created in six days. Charles Darwin, however, brought a new and glorious thought into the minds of the human denizens of this film; that creation is continuous and that it has first started the life principle and is still at work creating ever new and more glorious life forms. Do you not find that every garden and field is a church where one can observe actual creation going on under ones own eyes?

In learning something about plants it is best to firmly establish in ones mind the kinship of all creatures which have life. Those who would ridicule the doctrine of evolution take joy in making fun from their supposed descent from monkeys, and without ever having read Darwin's works attribute this statement to him. Science only means classified and arranged common sense and observation. Modern science has not yet determined from what particular form or species the erect standing man (Genus Homo) branched off, but all scientists are agreed that all forms both animal and vegetable originated on this planet millions of years ago from one or a few types of single cells.

These cells of extremely simple form being only slightly different from aggregations of molecules (small particles of matter) were scarcely distinguishable from non-living forms. Probably ages elapsed before combinations and re-combinations produced cell-forms which differed from one another. While one used sunlight to bring about changes within itself to form the green coloring matter of plants called chlorophyll, another had to continue to exist by obtaining food materials from those forms which manufactured this chlorophyll.

Imagine now a remote period of time when the earth was warm and these tiny living forms along the shores of a tropical ocean would be alternately washed upon a beach and washed back again into their habitat, the sea. Now imagine how valuable it would be if some of these sea-living cells put out a little projection which could absorb moisture and nourishment from the sand if the sea did not return to bring them

back within a short time. Thus probably developed the earliest roots and made possible forms of vegetable life which could live upon the earth.

Like the parable of the Bible, some of these fell on stony places, some fell on fertile soil. Those which were not adapted to their surroundings died, while those which varied no matter how slightly in the direction of survival, lived to carry on a new generation, which were best adapted to their surroundings. A single part of an orchid seed contains as many as a million and a half delicate seeds, lighter than the finest down. If all these survived it would be impossible to pass through a tropical forest. In fact they would take the earth. But only those adapted to special conditions, as perhaps the fork of a tree with a collection of dead leaves and decaying humus and a fairly constant water supply survived. A single tobacco plant (nicotiana) produces hundreds of thousands of small seeds which germinate so readily that they would soon become the entire vegetation of a country were it not for the fact that each seed must have a favorable environment and only those survive which can adapt themselves to the conditions in which they find themselves.

When plants developed to the point where they became what we know as perfect plants, that is with root, stem, leaves, flowers and seeds some had varied in the direction of requiring a moister climate. Others found themselves thrown upon stony or desert ground and adapted themselves more and more to conditions of increased drought and thereby became what we know today as succulent plants. The Fuchsias and Begonias which look so beautiful in greenhouses in northern and temperate climates would be burned by an Arizona sun in a few minutes; such plants are called mesophytes. Whereas the Barrel Cactus, such as *Ferocactus acanthodes* and its relatives refuse to do their best until a period of great dryness and intense heat is upon them. Plants such as the Ocotillo whose tall cane-like spiny stems topped with racemes of flaming red flowers put out leaves immediately after a desert rain and stores the nourishment formed by these leaves in its spiny stems. As the ground dries and the sun gets hotter and the months go by without more rain, these plants lose their leaves and shrink to dead looking twigs. The thickened water storing stems have the power of contraction and their internal juices turn into molecules called pentosans which do not readily give up water by evaporation. We call the class to which such plants belong, Xerophytes.

The African Mesembryanthemums have large, parsnip like roots for water storage and thickened fat leaves with few openings (stomata) or are reduced to from 2 to 4 thickened ball-like leaves such as those of the genus Lithops (living stones). Such plants we call succulents from the Latin word succus meaning juice. Attention has been called to the fact that some 20 to 30 families of the 200 families of flowering plants have varied in the direction of succulence illustrating another biological principle called parallelism. Such widely different families as the CACTACEAE, the EUPHORBIACEAE, the PASSIFLORACEAE, and many others have plants which are reduced by practically the same group of environmental forces to the globular, fleshy form with or without spines.

EDITOR'S NOTE: A. J. van Laren, in the book "Cactus," gives a very readable explanation of the origin and development of the cactus family. He states that the group of Pereskias must have been the starting point in form-development of all cacti and that they contain the most primitive forms of the entire order, because they are nearest to ordinary leaf-plants still possessing normal, permanent, leafy foliage and ordinary wood stems and branches.

Opuntias are nearest to the leafy Pereskia cacti, since some of the species still bear leaves. In *Opuntia tubulata* the leaves have become reduced in area, slender in form are of brief duration and render but little service to the plant.

The cotyledons (seed leaves), flowers, fruit, areoles and spines of cacti all show changes in development as the plant adapted itself to a dryer climate. The transition from leaf to branches is still distinct in some species such as *Opuntia cylindrica* which have cylindrical stems with angular projections; each of these protuberances at first bears a leaf, an areole, and an auxillary bud. In other species the cylindrical stem has narrowed towards each end and has gradually become shorter until it has reached an oval shape as in *O. glomerata;* finally the round stem has assumed the shape of discs or pads of uniform appearance as in *O. robusta. O. brasiliensis* is remarkable in this respect as the stem is cylindrical and only the side branches take the form of discs.

Then Mr. van Laren explains the development of tubercles and ribs until the fully succulent globular forms have taken the place of the large leaved shrubs and trees.

This brief explanation shows why Britton and Rose arranged the plants of "The Cactaceae" according to their development in evolution. Dr. Forrest Shreve in his book "The Cactus and Its Home" speaks of evolution and continues with "how the cactus is build" and gives a most valuable account of the general distribution. These two books are recommended for reference reading. Ask your library for them.

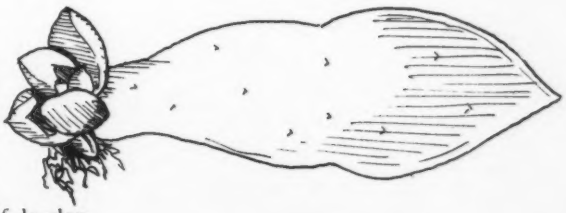
Miss Kate O. Sessions, founder of the Balboa Park Succulent Garden requests JOURNAL article on "Public Cactus Gardens"—their care, protection, methods of plant marking, etc. This is a most valuable suggestion and the articles should stimulate interest in public gardens throughout the country.

WANTED: A member living near the Editor's office to volunteer two afternoons each week. Phone Albany 9000.

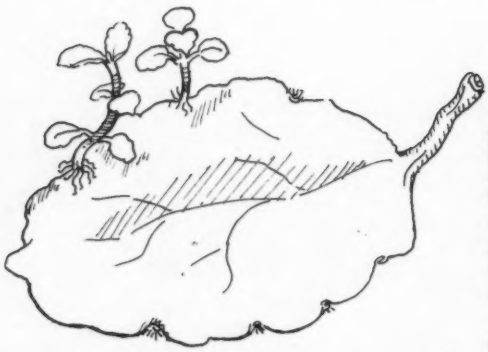
Interesting Succulents

Drawings by Margaret Kincher and Harold Treffry from plants in the garden of Albert Krejci of the California Cactus Nursery

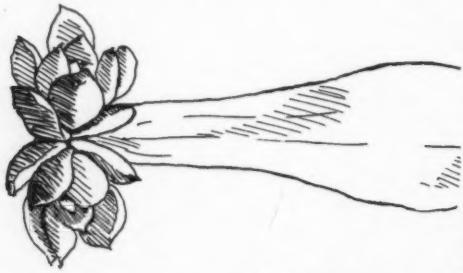
One reason for the ever increasing interest in the growing of the other succulents is their varied and interesting manner of propagation. Growing plants from leaves is much faster than from seed and no equipment is required. The various stages of development is fascinating and many enthusiasts have been won to the collecting ranks by having these interesting characteristics brought to their attention.



Byrnesia weinbergii, from Mexico, propagates very readily from leaves and unfolds into a marble-like plant. The two accompanying drawings show the growing leaf and a branch of the mature plant.



Leaf of *Bryophyllum crenatum*, so called Chinese sacred tea plant which may be seen growing its adventitious buds when a single leaf is pinned to a window curtain. It was upon this plant that Jacques Loeb made his world famous studies on regeneration.



Example of leaf propagation in *Echeveria amoena* which is one of the few Echeverias which can be propagated from leaves.

FRICK'S NOTES

In one village in Mexico, Opuntia branches are tied around the lamp posts to prevent mischievous Indian boys from climbing them to blow out the light.

* * * *

An exceptional plant is *Opuntia subulata* in that it bears leaves, which instead of being flat, are round and pointed like a leadpencil and from two to four inches long.

* * * *

Dr. W. A. Cannon who worked for several years on the root habits of desert plants, said that if the desert was turned upside down it would be pretty much of a jungle. Roots leave no cubic foot of the soil untaped.

* * * *

Characterized as the "conservationists dream realized" is the news from Mexico that the axe is no longer the one tool used to harvest the seeds of *Cephalocereus senilis*. A few forceful arrests has brought about a saner and easier means of gathering the fruit, and today they are collected with a tin can fastened to the end of a long bamboo pole.

I congratulate you on the excellency of the photographs published in your JOURNAL; they are not only instructive but interesting. L. D., *Argentina.*

AFFILIATED SOCIETIES

In accordance with the desire of the Cactus and Succulent Society of America to be of service to our associates, your Executive Board has instructed me to announce that the first of a number of papers to be loaned to Affiliated Societies is now ready, and may be procured from the Corresponding Secretary. These manuscripts are designed to assist societies to make up their programs. They would be still more interesting if members could exhibit specimens of the plants mentioned in these articles.

Mr. Carl Seelbach is the author of a series of papers entitled, "The Cactus Collector, Fancier or Specialist." He promises to define the difference between the two kinds of collectors and to furnish cultural and collecting information. He will also cover the subject of greenhouse construction and management. The following are the titles of five manuscripts Mr. Seelbach has completed: "Collecting by the Fancier or Collector," "Culture in Semi-Tropical Locations," "Greenhouse Construction and Culture," "Nomenclature" and "Grafting."

Mr. Wright Pierce is the athour of another series. He has chosen to write about individual plants that he has in his own collection. In another paper he tells interestingly of some of his trips through our deserts. His manuscripts carry the following titles: "Desert Memories," "Interesting Hairy Types of Cacti" and "Desirable Neomammillarias Other Than the Hairy Types." Mr. Pierce has used photographs to illustrate each one of his articles

Owing to the cost of the replacement of pictures a deposit of $2 will be required on each consignment sent out. Postage at present will have to be paid by the clubs using this service. This should not exceed twenty-five or thirty cents.

Requests for the loan of any of the above should be sent by the Secretaries of Affiliated Societies to Wm. J. Surganty, Cor. Sec'y, The Cactus and Succulent Society of America, 555 No. Ardmore Ave., Los Angeles, California.

WM. J. SURGANTY, *Cor. Sec'y.*

Mr. Eric Walther again flew to Mexico City to continue his field work on the Echeverias. The thorough manner of his investigations will make his monograph a lasting authority. Mr. Walther will return Nov. 23rd. Before leaving Los Angeles he suggested that the educational series of articles in the Journal be conducted by questions and answers, known as the Socratic method; the most related questions will form the basis of the next educational discussion. Your Editor will welcome questions so that this series will furnish the most helpful material to the student of Xerophytes.

1. *Cereus hildmannianus,* in garden of J. R. Pirtle & Sons, Edinburg, Texas. 2. *Consolea nubescens,* J. R. Pirtle & Sons. 3. *Harrisia bonplandii* flowering in H. M. Wegener's Collection, Los Angeles, Calif; 19 flowers opened in one night. 4. Collecting centers of "Yucca g:isens" for fiber. From Dr. W. E. Lowry, Laredo, Texas. 5. Gathering fruit of *Ferocactus pringlei,* Dr. W. E. Lowry. 6. *Homalocephala texensis cristata,* J. R. Pirtle & Sons.

OKLAHOMA CACTUS SHOW

The Cactus and Succulent Society of Oklahoma held their First Annual Show on October 12th and 13th in connection with the State Flower Show at Oklahoma City. The two shows were held in adjoining rooms and over eleven thousand visitors attended the two day session.

The cactus show, being the first of its kind in Oklahoma City, created a great deal of interest. Ribbon prizes were offered in all classes. The members of the Cactus and Succulent Society brought out their finest specimens and urged people from all over the state to enter. The result was a splendid exhibition including some 1476 specimens of cacti and succulents. Possibly 150 different varieties were shown.

Many native Oklahoma cacti were shown among them at least six unidentified Echinocereus. A fine collection of grafted cacti were also on display. The greatest interest, however, seemed to center on the cristates in which group were many native plants, mostly the *Echinocereus reichenbachii* variety. Only one *Echinocereus baileyii* cristate was shown. Also a cristate *Homolocephalo texensis* was shown.

It might also be of interest to cactus lovers that the Cactus and Succulent Society took three of the major prizes in the general flower show, first and third place in the "Unusual Potted Plant" competition and first prize in the "Shadow Box" competition. Imagine a lowly cactus taking first prize away from such queens of the floral world as the Rose and Dalhias.

R. A. CHUBB.

EDITOR'S NOTE: The Oklahoma Cactus and Succulent Society is making progress under the leadership of Mrs. Harry T. Johnson, Pres. In a future issue of the CACTUS JOURNAL will be shown some of the plants of interest including the group of prize winning crests.

Any cactus minded person living in the vicinity of Oklahoma City should communicate with Mrs. Marjorie H. Lee, Secy., 122 N. E. 11th St., Oklahoma City. Mrs. R. A. Searle travels 125 miles to attend their meetings; with such enthusiasm will their club succeed?

1000 NEW SOCIETY MEMBERS

That is the goal, for this year, set by your Editor; your cooperation is earnestly solicited. After six years of work and survival after a depression we have the largest membership in the history of the Society. During the last four years there has never been a greater interest in cacti and the other succulents and now is the time to make renewed growth. One person cannot accomplish this work alone and it is to our mutual advantage that we interest others so that we can enlarge and improve the CACTUS AND SUCCULENT JOURNAL.

FIRST: Ask your local library to buy books on cacti and succulents. Most libraries are glad to purchase books which are desired by their readers. The last few years have seen the publication of several fine books in this country as well as abroad. Libraries from Vermont to Florida and from Oregon to Texas are most appreciative of information on worth while books. Ask your library to send for "Cactus" by van Laren (on approval) or "The Stapelieae" by White and Sloane. If they do not have "The Cactus Book" by A. D. Houghton, that by all means, should be one of the first. Other books highly recommended are "Cactus and Its Home" by Forrest Shreve; "Arizona Cactus;" "Texas Cactus," "California Cactus;" "Succulents" by van Laren, "Study of Cactus" and "Cactus Growing for Beginners" by Vera Higgins. The Editor will gladly recommend books and have them sent on approval.

SECOND: Give a membership in the Society (and the CACTUS AND SUCCULENT JOURNAL) for a Christmas gift—12 installments of pleasure for the coming year. No finer gift can be given a cactus collector than this authorative magazine—most of us spend our spare money for plants and the Journal is a prized possession. An appropriate Cactus Christmas card will be sent with each gift book or membership.

THIRD: Send to the Editor for a 7x10, three color, art card for nurseries to hang in their greenhouses. This poster attracts attention to their cacti and states that sample copies of the CACTUS AND SUCCULENT JOURNAL will be sent to anyone interested. This suggestion came from Allan Mackintosh of Florida and we all know that the JOURNAL helps the dealer in stimulating interest, so this is the first request that the dealers help to enlarge the membership. Hang a poster in your own green house; you will be proud to advertise that you are a part of this international organization.

FOURTH: Let us send you a supply of application blanks that you may enclose in your catalogues or give to your friends.

FIFTH: Ask your local newspaper if they would accept a popular article on the Growing of Cacti and Succulents or a brief article on the popularity of these fascinating plants. We can furnish a coarse screen "mat" from which the local paper can make an illustration.

TO SUM UP THIS PROMOTIONAL WORK:

Recommend books to the local libraries.
Give the Journal and books this Christmas.
Send for display cards for your local dealer.
Send for a display card for your own green house.
Send for membership application blanks stating quantity.
Ask your local paper if they will accept an article on cacti.

Feel a part of this work and realize more enjoyment from this interesting hobby. Will you please write to the Editor to-day? Address, 6162 N. Figueroa St., Los Angeles, Calif.

Society members will be glad to know that James West is a member of the University of California Botanic Garden Expedition to the Andes now on a six months collecting trip in South America. His many friends will wish him a successful trip and will look forward to his return. The expedition is under the direction of Dr. T. H. Goodspeed, director of the Botanical Garden of the University of California. We may look to Dr. Goodspeed for interesting facts for the cactus world.

While away on a desert trip in Arizona and New Mexico, Cactus Pete, 5440 Valley Blvd., Los Angeles, was called home with the news that his office had been destroyed by fire. Correspondence was also lost and anyone having unanswered letters should write him at once.

Don't wait for scale, aphis and mealy-bug; spray now and save yourself hours of work besides the loss of your plants.

GIVE CACTUS BOOKS FOR CHRISTMAS

An appropriate Cactus Christmas card will be sent with each book order or Society Membership ordered as a gift.

CACTUS—By A. J. van Laren. A companion volume to "Succulents" with similar imported color prints of 140 different cacti in color. Bound in cloth. Numbered edition of 1000 copies, $5.00. $10.00 per set. "Succulents" sold separately for $7.50.

THE CACTUS AND ITS HOME—By Forrest Shreve. Written by a member of the society who is in charge of The Desert Laboratory of the Carnegie Institution. Describes what a cactus is, how it is constructed, names, tribes, families, cultivation and distribution. Based on scientific investigation, a great many questions are answered. 45 interesting illustrations, $2.50.

THE STAPELIEAE—By Alain White and Boyd L. Sloane. Only a few copies left. The most complete monograph on Stapelias. 224 pages with 250 illustrations, $3.00.

CALIFORNIA CACTUS—By E. M. Baxter. Describes all of the species of California with 85 illustrations. Compiled after 10 years of study. Common names, culture and locations, $1.50.

ARIZONA CACTI—By William Stockwell and Lucreta Breazeale. One of the most valuable books that has been published because of its scientific value in recording the cacti of Arizona and its illustrated glossary of terms used in describing cacti. Every student will appreciate the helpful information it contains, 45 cents.

TEXAS CACTI—By Ellen Schulz and Robert Runyan. 180 pages with complete illustrations of the native cacti of Texas. One of the most complete and valuable books on cacti. A few more copies have been secured, but the supply is nearly exhausted. Order now while the price is $3.00.

THE CACTUS BOOK
by
A. D. Houghton

From this book you will learn the secrets of successful watering, how to grow Cacti from seeds, how to propagate the rare species by grafting, how to hybridize, how to grow indoors in pots, and on window sills, how to purchase and trade to get new sorts and what kinds to grow for different effects. Also introduces you to more than 1,000 different kinds of Cacti with information for selecting the types you need for every purpose and location.

Price $2.25 Postpaid

Cactus & Succulent Society of America

THE STUDY OF CACTI—By V. Higgins. Start your cactus library with this book which explains Britton and Rose in a clear, readable manner. For beginners and advanced collectors. Cactus names explained. All genera listed, $2.25.

Mail Address: THE CACTUS JOURNAL, 6162 North Figueroa St., Los Angeles, Calif.

We learn from the most recent London Hort. Journal that the recent Cactus and Succulent Show there was twice the size of the initial one of last year, when it was a good deal of an experiment for the Royal Hort. Society to permit them a date even to hold an exhibition. It is good to know that plants were brought long distances to London for this show and the success was a surprise to them all.

I am enjoying the JOURNAL and finding much profit in the reading of it. I should like to express my appreciation for the reprinting of Vol. 2 of the CACTACEAE and likewise for the plant identification service. Whoever originated the idea deserves much credit as does also Dr. Poindexter for the kind service he is rendering.

R. W., *Penn.*

I think that the suggestion of semi-scientific articles in the JOURNAL may be a good move, as no doubt the majority of your readers have only a slight knowledge of botany and would welcome articles that they can fully understand. I have gotten more real pleasure and information from the pages of the JOURNAL than from any other piece of literature that I have read.

R. C. B., *Texas.*

NEW LISTS

Novelty Plant and Pottery Co., P. O. Box 1063, Eastland, Texas. Two page printed list of cacti and pottery. (Free)

EDITOR'S NOTE

Only legitimate dealers are asked to advertise in the JOURNAL. If two or more proven complaints are received by the Society, no further advertising will be accepted from that dealer until all difficulties have been adjusted.

1935 EPIPHYLLUM SEEDS FOR SALE

Order now before they are gone. Only 200 of each kind to a customer. Wish to encourage collectors. Will not substitute if gone, therefore quote alternate.

At 20c per 100—Hermosus, Strictum (Trelease), Stenopetalum (C. Conzattii). At 35c per 100—Hermosissimus, Crenatus Eichlam, Crenatus (Dr. Rose)*, Koening Humbert, Large Rose (favorite). At 40c per 100—Colonel Kuehnrich*, Hofrat Bouche*' Herman Roestel*, Crebatus (curved leaf), Roseus superbus, Empereur, Dark Rose (bell shaped*). At 50c per 100—Ernst Seyderhelm* (giant), Copper Color (giant), Epinicereus Friend Wegener*, Hans Rehm* (odd leaf). NEW CREATIONS, pollin, with Selenicerei: At 50c per 100—Hermosus, hermosissimus, Largest Rose (Maechtlen). At 75c per 100—Epinic. Friend Wegener, Emperatrice Eugenie Phyllo with Phyllo at 50c per 100—Crenatus (curved) w/ Empereur, Souvenir Otto Schmidt w/Yellow striped, Ernst Seyderhelm w/ Hermosissimus (only 100 left). Those marked * none on the market. Please do not write for wholesale price on Phyllos as I am not in business, but would advise raising phyllos from seeds. Demand for plants from all over the world is way over the supply and import prohibitive due to exchange rate. Like to sell about 50 cuts (1 in. thick) of 12 to 15 in. of Harr. bonplandii at 35c per cut. (f.o.b. Los Angeles).

H. M. WEGENER
Private collection of Phyllocactus
1190 Leighton Ave., Los Angeles, Calif.

FERDINAND SCHMOLL
Cadereyta, Qro. Mexico
Owner of the export permit of the Mexican Government offers you his well-known selected cacti and other succulents at moderate prices.

"CACTI FOR THE AMATEUR COLLECTOR"
250 species of cacti illustrated. Cacti and their culture. Send $1.00 to LAWSON CACTUS GARDENS, 1223 S. Adams St., San Antonio, Texas.

Rare Cactus Seedlings
Six seedlings for $1.25 postpaid in U. S.
No two alike. Two years old.
We also exchange
L. E. BERRY
2040 W. 81st St., Los Angeles, Calif.

THE CACTUS HOUSE
5427 Hillside Road, Richmond, Calif.
RARE TWO AND THREE YEAR CACTI
SEEDLINGS
1935 Catalogue on Request

SPECIAL THIS MONTH
Eight foreign Cactus Seedlings for $1.00 *prepaid. Your choice of:*
Cephalocereus catingicola, euphorbiodes, gounellei, palmeri, polylophus, senilis; Pilocereus chrysostele, glaucescens; Escontria chiotilla; Pachycereus columnatrajani, marginatus, pecten-aboriginum, pringlei; Lemaireocereus chichipe, dumortieri, laetus, queretaroensis, stellatus, thurberi; Trichocereus pasacana, bridgesi, spachianus, chiloensis, herzogosus, werermanni; Borzicactus straussi; Binghamia acrantha, melanostele; Oreocereus trolli, celsianus; Cleistocactus baumanni; Myrtillocactus geometrizans, schencki; Cereus bolivianus; Echinocereus delaeti; Chamaecereus sylvestri; Echinofossulocactus zacatecensis; Ferocactus crassihamatus; Echinocactus ingens; Malacocarpus maassi; Neomammillaria bocasana, compressa, elongata, magnimamma, bocasana, magnimamma; Coryphantha pallida.
KNICKERBOCKER NURSERY
Rt. No. 1, San Diego, Calif.

Seedlings of DENDROCEREUS NUDIFLORUS 50c—3 for $1.00, also many Rebutias, Lobivias and other rare cacti at same price.
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1000 N. Temple St., Compton, Calif.

Caralluma wilfriedii; Trichocaulon karasmontanum, englerii; Piaranthus nebrownii; Stapelia portae-taurinae, longipes, fleckii, dinterii, 25c each. *Ceropegia meyerii,* 50c; *radicans* and *stapeliaeformis,* 30c each.
CALIFORNIA CACTUS NURSERY
14427 Kittridge St., Van Nuys
Specializing in Cacti, Asclepiads, Mesembryanthema, etc.

RARE EUPHORBIA
Euphorbia reinhardtii, 2 years old, $2.50 ea.
Euphorbia royleana, 1 year old..... 1.00 ea.
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All four for $5.00, postpaid
These Euphorbia are exceedingly rare and will make wonderful additions to your collection.
Many Mexican Cacti 4 to 5 years old at reasonable prices. Will exchange for Cacti, Euphorbia and Orchids.
EUGENE R. ZIEGLER
Spencerport, N. Y.

ANY 8 OF THE FOLLOWING UNUSUAL SUCCULENTS WILL BE SENT POSTPAID IN THE UNITED STATES FOR $1.00:
Aloe beding hausii, A. corniculata, Agave stricta, Anacampseros rufescens, Crassula corambulosa, C. rosularis, Cotyledon teretifolia, C. decussata-gilpini, Dyckia rariflora, D. sulphura, Echeveria bifurcata, E. carnicolor, E. byrnesii, E. nivalis, E. hoveyi, E. nodulosa, Euphorbia bubalina, E. globosa, Gasteria verrucosa, Haworthia atrovirens, H. cymbiformis, H. coractata, Heurnia penzigii, H. schniederianus, Pachyveria orpeti, P. clavata, P. schiedeckeri, Sedum jackardina.
SCHICK NURSERY
715 S. Central Ave., Glendale, Cal.

WEST INDIAN CACTUS PLANTS
can now be secured without special permit by writing to
G. ANTON
Box 922, Mayaguez, P. R.

THE CACTACEAE, Vol. 1, as reprinted in one color in the Journal. An exact reprint of Carnegie Institute's contribution to cactus literature. Bound in heavy buckram $10.00